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Windsor, NJ 08550 (US). **FAKES, Michael, G.** [US/US];
15 Derby Chase Court, Belle Mead, NJ 08502 (US).

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(74) Agents: **ALGIERI, Aldo, A.** et al.; Bristol-Myers Squibb
Co., P.O. Box 4000, Lawrenceville-Princeton Rd., Prince-
ton, NJ 08543 (US).

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(71) Applicant (*for all designated States except US*): **BRIS-
TOL-MYERS SQUIBB CO.** [US/US]; P.O. Box 4000,
Lawrenceville-Princeton Rd., Princeton, NJ 08543 (US).

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(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **COLONNO,**
Richard, J. [US/US]; 18 Salisbury Way, Farmington,
CT 06032 (US). **SPROCKEL, Omar, L.** [US/US]; 1250
Dogwood Drive, Bridgewater, NJ 08807 (US). **HARI-
ANAWALA, Abizer** [IN/US]; Apt. #A, 607 Cranbury
Cross Rd., North Brunswick, NJ 8902 (US). **DESAI,**
Divyakant [IN/US]; 19 Greenfield Drive North, West

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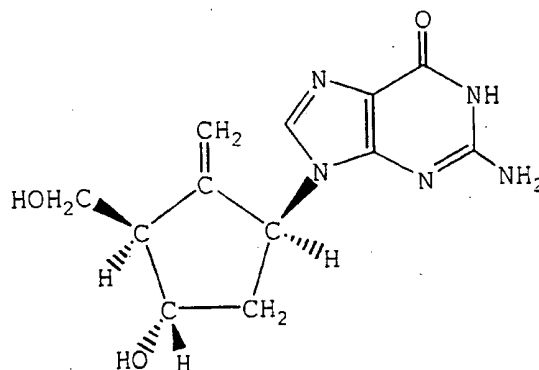
(54) Title: **LOW DOSE ENTECAVIR FORMULATION AND USE**

(57) Abstract: Compositions containing a low dose of entecavir are administered on a daily basis to treat hepatitis B virus infection and/or co-infections. Formulations for the oral administration of a low dose of entecavir are provided. Other pharmaceutically active substances can be included in the entecavir composition or can be separately administered for the treatment of hepatitis B virus infection or for the treatment of co-infected patients.

Low Dose Entecavir Formulation And Use

5

Entecavir, [1S-(1 α , 3 α , 4 β)]-2-amino-1,9-dihydro-9-[4-
10 hydroxy-3-(hydroxymethyl)-2-methylenecyclopentyl]-6H-
purin-6-one



is an antiviral agent currently undergoing clinical
15 evaluation for the treatment of hepatitis B virus
infection.

Entecavir and its use in treating hepatitis B are
disclosed by Zahler et al. in U.S. Patent 5,206,244.
This patent discloses that an effective antiviral dose
20 for oral or parenteral administration will likely be in
the range of about 1.0 to 50 mg/kg of body weight and
that the desired dose may be administered several times
daily at appropriate intervals.

Improved methods for the synthesis of entecavir are
25 disclosed by Bisacchi et al. in WO 98/09964.

This invention is directed to pharmaceutical compositions containing a low dose of entecavir and the use of such low dose composition to safely and
5 effectively treat hepatitis B virus infection.

This invention is also directed to pharmaceutical compositions for oral administration containing low doses of a pharmaceutically active substance. This result is achieved by adhering particles of the pharmaceutically
10 active substance to the surface of a carrier substrate. The process of depositing the active substance on the carrier substrate is controlled to minimize the agglomeration of the active substance/carrier substrate particles.

15 This invention is directed to pharmaceutical compositions containing a low dose of from about 0.001 mg to about 25 mg of the active antiviral agent entecavir for once daily administration to treat hepatitis B virus
20 infection in an adult human patient. Preferred pharmaceutical compositions contain from about 0.01 mg to about 10 mg of entecavir and most preferred pharmaceutical compositions contain from about 0.01 to about 5 mg of entecavir. Such preferred and most
25 preferred pharmaceutical compositions are also administered once daily to treat hepatitis B virus infection in an adult patient.

The term adult human patient is defined as a patient of about 16 years or more of age and a weight equal to or
30 greater than about 50 kilograms. Pharmaceutical compositions containing entecavir at the lower end of the above ranges are suitable for administration to pediatric

patients or adult patients weighing less than about 50 kilograms.

The low dose entecavir pharmaceutical compositions described above for daily administration may also be administered to certain patients less often. For example, patients who have been treated by daily administration of the low dose entecavir pharmaceutical compositions so that their hepatitis B virus infection is now under control may be placed on a maintenance regimen to protect against further infection. Such maintenance therapy may involve the administration of the low dose entecavir composition on a less than daily basis. For example, a single dose administered every three or four days or administered on a weekly basis may be sufficient.

The low dose entecavir pharmaceutical compositions of this invention can be formulated for administration by any suitable means. For example, compositions for oral administration, which are preferred, can be in the form of tablets, capsules, granules or powders or in the form of elixirs, solutions or suspensions. The low dose entecavir pharmaceutical compositions may also be formulated for parenteral, rectal, transdermal or nasal administration according to methods well known in the art. Such formulations can include pharmaceutically acceptable excipients including bulking agents, lubricants, disintegrants, binding agents, etc. as commonly employed in such compositions. Sustained release formulations are also within the scope of this invention.

Surprisingly, it has been found that once daily administration of the low dose entecavir pharmaceutical compositions of this invention are effective in treating hepatitis B virus infection without undesirable side effects that can result from administration of the high dose regimen described in U.S. Patent 5,206,244.

This invention is also directed to the treatment of hepatitis B virus infection with low dose entecavir compositions as described above in combination with one or more other pharmaceutically active agents. Suitable pharmaceutically active agents for this purpose include one or more antiviral agents, for example, didanosine, lamivudine, abacavir, adefovir, adefovir dipivoxil, famciclovir, (2R,4R)-4-(2,6-diamino-9H-purin-9-yl)-2-hydroxymethyl-1,3-dioxolane (DAPD), hepatitis B immunomodulating proteins (EHT 899 from Enzo Biochem), emtricitabine, 1-(2-deoxy-2-fluoro- β -D-arabinofuranosyl)thymine(FMAU), GLQ-223 (Compound A, alpha-trichosanthin), epavudine (L-dT), epcitabine (L-dC), ribavirin, tenofovir (PMPA), 2',3'-dideoxy-2',3'-didehydro-beta-L(-)-5-fluorocytidine[L(-)Fd4C], as well as other fluoro L- and D- nucleosides. Suitable pharmaceutically active agents for this purpose also include one or more immunomodulators, for example, alpha interferon, beta interferon, pegylated interferon, thymosin alpha, and hepatitis B vaccines such as HBV/MF59, Hepagene and Theradigm-HBV.

When the other pharmaceutically active agent or agents are suitable for oral administration, they can be combined with the low dose of entecavir into a single tablet or capsule. If the other pharmaceutically active agent or agents are not compatible with entecavir for co-administration from a single dosage form, for example, if the mode of administration is different or if the frequency of administration is different, then the other pharmaceutically active agent or agents will be administered separately. The amount of the other agent or agents administered is that conventionally employed in mono therapy or a reduced amount as determined by the treating physician. The separate dose forms can be

administered at the same time or sequentially according to a prescribed schedule.

This invention also includes the treatment of co-infected patients with the low dose entecavir compositions described above. A co-infected patient is one infected with other viral or non-viral diseases in addition to hepatitis B. In particular, such treatment is possible for hepatitis B patients co-infected with hepatitis C or HIV. Such co-infected patients are preferably treated with the low dose entecavir compositions as described above in combination with one or more other pharmaceutically active agents as described above. For example, a patient co-infected with hepatitis B and hepatitis C can be treated with the low dose entecavir composition in addition to being treated with a regimen of ribavirin and an interferon.

Another aspect of this invention is the preparation of pharmaceutical compositions, particularly tablets and capsules, containing entecavir in an amount of less than or equal to about 10 mg. Such compositions cannot be prepared with good content uniformity by simply mixing the active substance and the excipients. The traditional methods of granulation are also not suitable for products active at such low doses.

Tablet and capsule formulations containing from about 0.001 mg to about 10 mg of entecavir are prepared according to the following procedures that ensure high potency and good uniformity of the product. The compositions are prepared by first carefully depositing the entecavir on the surface of carrier substrate particles. This step is accomplished by forming a solution of the entecavir in a solvent along with an adhesive substance at temperatures ranging from about 25°C to about 80°C and applying the solution as a spray or a stream while the carrier substrate particles are in

motion. The conditions are controlled to minimize particle agglomeration. Subsequently, the solvent is removed from the carrier surface leaving the entecavir particles adhered to the surface of the carrier
5 substrate. This prevents the separation of the entecavir from the substrate and minimizes the loss of entecavir during subsequent processing.

Following drying, the entecavir coated carrier substrate particles are mixed with any other ingredients
10 to be included in the composition such as a disintegrant and/or lubricant. The resulting powder is then compressed into tablets or filled into capsules.

The carrier substrate particles are kept in motion during the spraying step by means of mechanical or air
15 stream agitation. In the mechanical agitation procedure, the carrier substrate is placed in a mechanical (high shear) mixer and agitated. A solution containing the entecavir and adhesive substance maintained at a temperature of from about 25°C to about 80°C is sprayed
20 onto the carrier substrate particles at a controlled rate and atomizing pressure (0 to 2 bar). To maximize the amount of entecavir deposited on the carrier, the position of the spray assembly is adjusted to make certain that the spray pattern only encompasses the
25 carrier. The rate of deposition and the spray pattern are controlled to minimize particle agglomeration. Once the entecavir containing solution is deposited, the wet entecavir/carrier substrate particles are transferred to a drier, either a tray drier or fluidbed drier is
30 suitable. The solvent is removed at an elevated temperature. When the solvent is water or pH adjusted water, a temperature of from about 50° to about 80°C is suitable.

In the air stream agitation procedure, the carrier substrate is placed in a bowl with a fine mesh screen at the bottom. The incoming air stream is adjusted so that the substrate particle motion is constant and fluid. The carrier material is equilibrated to a temperature of from about 25°C to about 80°C. A solution containing the entecavir and adhesive substance maintained at a temperature of from about 25°C to about 80°C is sprayed onto the carrier substrate particles at a controlled rate and atomizing pressure as described above. Again, the position of the spray assembly is adjusted to make certain that the spray pattern only encompasses the carrier and the rate of deposition is controlled to minimize particle agglomeration. Once the entecavir solution is deposited, the temperature is elevated to remove the solvent. When the solvent is water or pH adjusted water, a temperature of from about 50°C to about 80°C is suitable. In the air stream agitation procedure, both the deposition of the entecavir onto the carrier substrate and the removal of the solvent are carried out in a single unit whereas the mechanical agitation procedure requires a two-unit operation.

The above procedures have the additional advantage of reducing exposure of the manufacturing personnel to entecavir in the atmosphere of the facility.

While the above procedures are described for preparing pharmaceutical compositions containing from about 0.005 mg to about 10 mg of entecavir, they can also be employed to prepare pharmaceutical compositions containing low doses of any soluble pharmaceutically active substance.

Preferred solvents in the above procedures are water and pH adjusted water. The solubility of entecavir in water can be increased by lowering the pH of water by the

addition of an acid such as hydrochloric acid or by raising the pH of water by the addition of a base such as ammonium hydroxide.

The adhesive substance is preferably a polymeric material possessing a high degree of tackiness. Suitable materials include povidone, methylcellulose, hydroxymethylcellulose, hydroxypropylmethylcellulose, hydroxypropylcellulose, hydroxyethylcellulose, gelatin, guar gum, and xanthan gum and mixtures thereof with povidone being preferred. The adhesive substance is preferably present in the final composition at from about 0.01% to about 10% by weight of the total composition.

The carrier substrate is a pharmaceutically acceptable substance that can be readily spray coated and yet will not easily agglomerate. Suitable materials include lactose, microcrystalline cellulose, calcium phosphate, dextrin, dextrose, dextrates, mannitol, sorbitol, and sucrose and mixtures thereof with lactose and microcrystalline cellulose and mixtures thereof being preferred. The carrier substrate is preferably present in the final composition at from about 80% to about 95% by weight of the total composition.

A disintegrant is preferably included in the final composition at from about 1% to about 7% by weight of the total composition. Suitable disintegrants include crospovidone, croscarmellose, sodium starch glycolate, pregelatinized starch, and corn starch and mixtures thereof with crospovidone being preferred.

A lubricant is preferably included in the final composition at from about 0.1% to about 5% by weight of the total composition. Suitable lubricants include magnesium stearate, stearic acid, sodium stearyl fumarate, and sodium lauryl sulfate with magnesium stearate being preferred.

The resulting tablet or capsule can be film coated for ease of administration. Suitable materials for use in the film coating are polymeric coating agents, pigments, plasticizers, solubilizing agents, etc.

- 5 Suitable coating agents include hydroxypropyl methylcellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, hydroxypropyl methylcellulose phthalate, etc. Polyethylene glycol can be included in the film coating composition as a plasticizer. Additional plasticizers
10 such as diethyl citrate and triethyl citrate may also be included in the film coating composition. Suitable solubilizing agents include polyoxyethylene sorbitan fatty acid esters particularly polysorbate 80. Suitable pigments include titanium dioxide and various iron
15 oxides.

- The ingredients of the coating compositions are dispersed in a suitable solvent, preferably water. The coating composition can be applied to the tablets or capsules using conventional pan coating or spray coating
20 techniques.

The following examples describe low dose entecavir compositions within the scope of this invention.

Example 1

Employing the above procedures a tablet of 0.5 milligram strength entecavir was prepared.

5

Ingredient	Amount % weight/weight	Amount per tablet
Entecavir	0.5	0.50 mg
Lactose monohydrate, NF	60.00	60.00 mg
Microcrystalline cellulose, NF	32.50	32.50 mg
Crospovidone, NF	4.00	4.00 mg
Povidone, USP	2.50	2.50 mg
Magnesium Stearate, NF	0.50	0.50 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

*removed by drying

Example 2

Employing the above procedures a tablet of 0.1 milligram strength entecavir was prepared.

5

Ingredient	Amount % weight/weight	Amount per capsule
Entecavir	0.1	0.1 mg
Lactose monohydrate, NF	60.00	60.00
Microcrystalline cellulose, NF	35.39	35.39 mg
Crospovidone, NF	4.0	4.00 mg
Povidone, USP	0.01	0.01 mg
Magnesium Stearate, NF	0.5	0.5 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

*removed by drying

Example 3

Employing the above procedures a tablet of 0.01 milligram strength entecavir was prepared.

5

Ingredient	Amount % weight/weight	Amount per tablet
Entecavir	0.01	0.01 mg
Microcrystalline cellulose, NF	93.24	93.24 mg
Crospovidone, NF	4.00	4.00 mg
Povidone, USP	2.50	2.50 mg
Magnesium Stearate, NF	0.25	0.25 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

*removed by drying

Example 4

Employing the above procedures a 10 milligram strength entecavir capsule was prepared.

5

Ingredient	Amount % weight/weight	Amount per capsule
Entecavir	10.00	10.00 mg
Microcrystalline cellulose, NF	82.03	82.03 mg
Crospovidone, NF	4.00	4.00 mg
Povidone, USP	2.50	2.50 mg
Magnesium Stearate, NF	0.25	0.25 mg
Hydrochloric acid	1.22	1.22 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

Capsule shell -----

*removed by drying

Example 5

Employing the above procedures a 0.05 milligram strength entecavir capsule was prepared.

5

Ingredient	Amount % weight/weight	Amount per capsule
Entecavir	0.05	0.05 mg
Dicalcium phosphate, NF	93.20	93.20 mg
Crospovidone, NF	4.00	4.00 mg
Hydroxypropyl cellulose, NF	2.50	2.50 mg
Magnesium Stearate, NF	0.25	0.25 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

Capsule shell

*removed by drying

Example 6

Employing the above procedures a tablet of 1 milligram strength entecavir was prepared.

5

Ingredient	Amount % weight/weight	Amount per tablet
Entecavir	1.00	1.00 mg
Mannitol, NF	90.00	90.00 mg
Croscarmellose sodium, NF	4.00	4.00 mg
Methyl Cellulose, NF	2.50	2.50 mg
Stearic Acid, NF	2.50	0.25 mg
Purified Water, USP*	q.s.	---
Total	100.00	100.00 mg

*removed by drying

Example 7

The 100 mg tablet of Example 1 containing 0.5 mg of entecavir, the 100 mg tablet of Example 2 containing 0.1 mg of entecavir, the 100 mg tablet of Example 3 containing 0.01 mg of entecavir and the 100 mg tablet of Example 6 containing 1.0 mg of entecavir can be film coated with the composition set forth below using conventional pan coating or spray coating techniques.

10

Ingredient	Amount % weight/weight	Amount per tablet ¹
Opadry®	1 to 10	1 to 10 mg
Plasticizer ²	0 to 10	0 to 10 mg
Purified Water, USP*	q.s.	----

*removed by drying

Opadry® is commercially available and contains hydroxypropylmethylcellulose, titanium dioxide, polyethylene glycol, polysorbate 80, synthetic yellow iron oxide and synthetic red iron oxide.

¹ The calculations are done assuming a tablet weight of 100 mg.

² Suitable plasticizers are diethyl citrate and triethyl citrate.

Example 8

5 The safety and antiviral activity of entecavir given
for 28 days to human subjects with chronic hepatitis B
virus infection was studied in a randomized, double-
blind, placebo-controlled, dose-escalating trial.
Entecavir demonstrated potent antiviral activity at all
doses tested. The mean log reduction in hepatitis B
virus DNA viral levels in the blood at day 28 were 2.21,
10 2.25, 2.81, and 2.42 for the 0.05, 0.1, 0.5 and 1.0 mg
once daily doses of entecavir, respectively. Entecavir
was well tolerated.

Example 9

15 The safety and antiviral activity of three doses of
entecavir (0.01 mg, 0.1 mg and 0.5 mg) given once daily
for 24 weeks were studied in adults with chronic
hepatitis B in a randomized, double-blind, lamivudine
20 (100 mg QD) controlled trial. All three doses of
entecavir demonstrated potent antiviral activity. The
two higher doses of entecavir produced significantly
greater reductions in hepatitis B virus DNA viral levels
in blood compared to lamivudine. Entecavir at all doses
25 was well tolerated.

What is claimed is:

1. A pharmaceutical composition for once a day
administration to treat hepatitis B virus infection
5 comprising a pharmaceutically acceptable carrier and from
about 0.001 mg to about 25 mg of entecavir.
2. A composition of Claim 1 wherein:
said entecavir is present at from about 0.01 mg to about
10 10 mg.
3. A composition of Claim 1 wherein:
said entecavir is present at from about 0.01 mg to about
5 mg.
15
4. A composition of Claim 3 wherein said entecavir
is present at about 0.01 mg.
5. A composition of Claim 3 wherein said entecavir
20 is present at about 0.05 mg.
6. A composition of Claim 3 wherein said entecavir
is present at about 0.1 mg.
- 25 7. A composition of Claim 3 wherein said entecavir
is present at about 0.5 mg.
8. A composition of Claim 3 wherein said entecavir
is present at about 1.0 mg.
30
9. A composition of Claim 1 in the form of a
tablet or capsule.
10. A composition of Claim 1 containing one or more
35 other pharmaceutically active substances.

11. A pharmaceutical composition for oral
administration of a low dose of entecavir comprising:
from about 0.001 mg to about 10 mg of entecavir
5 adhered to a carrier substrate.

12. A composition of Claim 11 wherein:
said carrier substrate is selected from lactose,
microcrystalline cellulose, calcium phosphate, dextrin,
10 dextrose, dextrates, mannitol, sorbitol and sucrose, and
mixture thereof, and
said entecavir is adhered to said substrate by an
adhesive substance which is a polymeric material
possessing sufficient tack.

15 13. A composition of Claim 12 wherein:
said adhesive substance is selected from povidone,
methylcellulose, hydroxymethylcellulose, hydroxypropyl-
methylcellulose, hydroxypropylcellulose, hydroxyethyl-
20 cellulose, gelatin, guar gum, and xanthan gum and
mixtures thereof.

14. A composition of Claim 11 including a lubricant
and a disintegrant wherein:
25 said lubricant is selected from magnesium stearate,
stearic acid, sodium stearyl fumarate, and sodium lauryl
sulfate, and mixtures thereof and said disintegrant is
selected from crospovidone, croscarmellose sodium, sodium
starch glycolate, pregelatinized starch, and corn starch
30 and mixtures thereof.

15. A pharmaceutical composition for oral administration of a low dose of entecavir comprising entecavir coated by means of an adhesive substance to a carrier substrate, a lubricant, and a disintegrant
5 wherein:
said entecavir is present at from about 0.001 to about 10% by weight of said composition,
said adhesive substance is present at from about 0.01 to about 10% by weight of said composition,
10 said carrier substrate is present at from about 80 to about 95% by weight of said composition,
said disintegrant is present at from about 1 to about 7% by weight of said composition, and
said lubricant is present at from about 0.1 to about
15 5% by weight of said composition.

16. A composition of Claim 15 wherein:
said adhesive substance is selected from povidone, methylcellulose, hydroxymethylcellulose, hydroxypropyl-
20 methylcellulose, hydroxypropylcellulose, hydroxyethylcellulose, gelatin, guar gum, and xanthan gum and mixtures thereof,
said carrier substrate is selected from lactose, microcrystalline cellulose, calcium phosphate, dextrin,
25 dextrose, dextrates, mannitol, sorbitol, and sucrose and mixtures thereof,
said disintegrant is selected from crospovidone, croscarmellose sodium, sodium starch glycolate, pregelatinized starch, and corn starch, and mixtures
30 thereof, and
said lubricant is selected from magnesium stearate, stearic acid, sodium stearyl fumarate, and sodium lauryl sulfate, and mixtures thereof.

17. A composition of Claim 16 wherein:
said adhesive substance is povidone; said carrier
substrate is microcrystalline cellulose or lactose or
mixtures thereof; said disintegrant is crospovidone; and
5 said lubricant is magnesium stearate.

18. The low dose entecavir tablet composition
comprising:
about 0.01% entecavir,
10 about 93.24% microcrystalline cellulose,
about 4.0% crospovidone,
about 2.50% povidone, and
about 0.25% magnesium stearate, said percentages
being on a weight/weight basis; or
15 about 1.0% entecavir,
about 90.0% mannitol,
about 4.0% croscarmellose sodium,
about 2.50% methyl cellulose, and
about 2.50% stearic acid, said percentages being on
20 a weight/weight basis; or
about 0.5% entecavir,
about 60.00% lactose monohydrate,
about 32.50% microcrystalline cellulose,
about 4.0% crospovidone,
25 about 2.50% povidone, and
about 0.50% magnesium stearate, said percentages
being on a weight/weight basis; or
about 0.1% entecavir,
about 60.00% lactose monohydrate,
30 about 35.39% microcrystalline cellulose,
about 4.0% crospovidone,
about 0.01% povidone, and
about 0.5% magnesium stearate, said percentage being
on a weight/weight basis.

35

19. The low dose entecavir tablet composition of Claim 18 having an outer film coating.

20. The low dose entecavir capsule composition
5 comprising:
about 10.0% entecavir,
about 82.03% microcrystalline cellulose,
about 4.00% crospovidone,
about 2.50% povidone,
10 about 0.25% magnesium stearate, and
about 1.22% hydrochloric acid, said percentages being on
a weight/weight basis; or
about 0.05% entecavir,
about 93.20% dicalcium phosphate,
15 about 4.00% crospovidone,
about 2.50% hydroxypropyl cellulose, and
about 0.25% magnesium stearate, said percentages
being on a weight/weight basis.

20 21. The method of preparing a pharmaceutical
composition for oral administration containing a low dose
of a soluble pharmaceutically active agent comprising:
(a) dissolving said pharmaceutically active agent
and an adhesive substance in a solvent,
25 (b) spraying said solution from step (a) onto a
carrier substrate while said carrier substrate is in
motion,
(c) drying said coated carrier substrate from step
(b) to remove said solvent, and
30 (d) combining said dried coated carrier substrate
from step (c) with other desired ingredients to form said
pharmaceutical composition.

22. The method of Claim 21 wherein:
said pharmaceutically active substance is entecavir which
is present at from about 0.001 to about 10% on a
weight/weight basis of said composition, and said solvent
5 is water or water having an acidic or basic pH.

23. The method of Claim 21 wherein:
said carrier substrate is kept in motion during spraying
step (b) by mechanical agitation, and
10 said coated carrier substrate is dried in step (c) in a
tray drier or fluidbed drier; or said carrier substrate
is kept in motion during spraying step (b) by air stream
agitation, and
said coated carrier substrate is dried in step (c) also
15 by means of air stream agitation.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

MEDLINE, CHEM ABS Data, EPO-Internal, WPI Data, PAJ, BIOSIS, EMBASE, SCISEARCH

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GRAUL, A. ET AL: "BMS - 200475: Anti-HBV" DRUGS FUTURE (1999), 24(11), 1173-1177 , XP000995923 page 1176	1-3,8, 10,11
X	GENOVESI E V ET AL: "Efficacy of the carbocyclic 2'-deoxyguanosine nucleoside BMS - 200475 in the woodchuck model of hepatitis B virus infection 'published erratum appears in Antimicrob Agents Chemother 1999 Mar;43(3):726!." ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, (1998 DEC) 42 (12) 3209-17. , XP000996177 abstract page 3210 -page 3216	1-3,8, 10,11
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Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Brunnauer, H

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